107 No. 9 October 18, 1947

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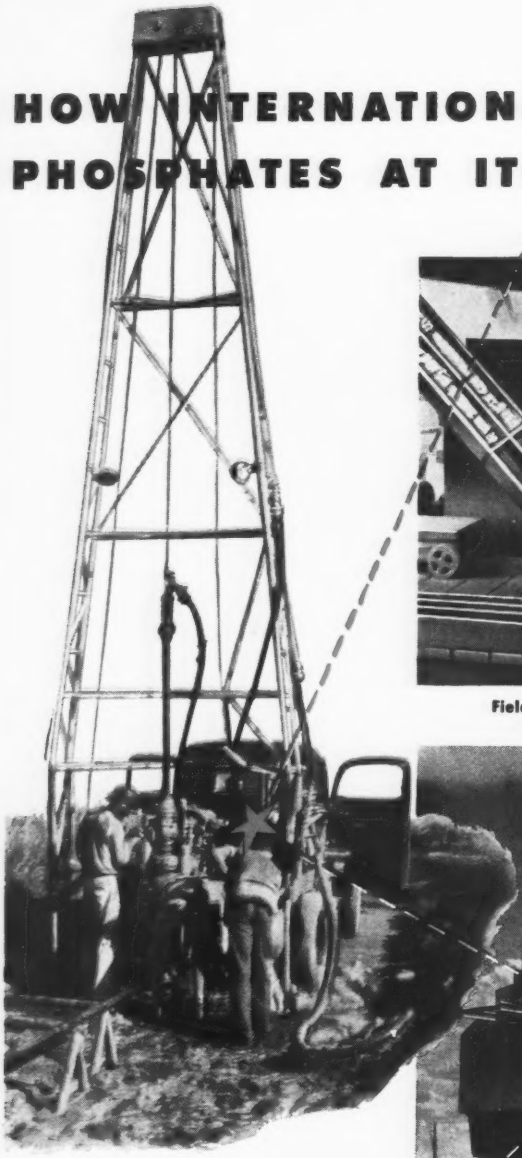
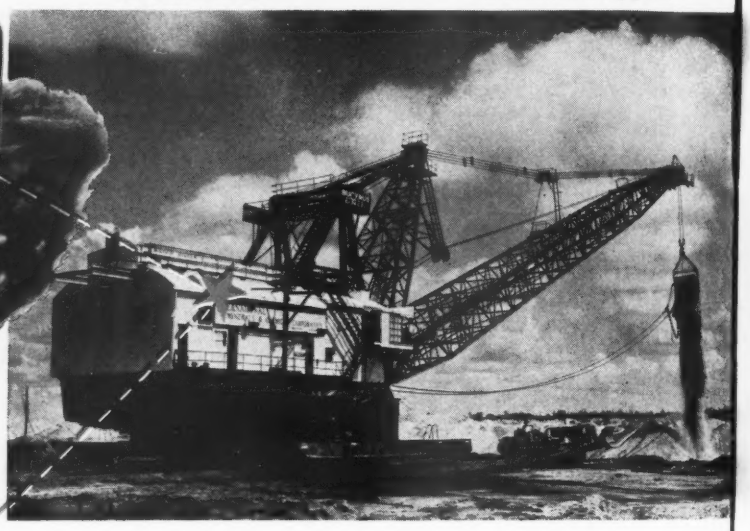


Men prospecting for phosphate

Field research establishes value of territory

Hydraulic water "guns" flush matrix into pipeline



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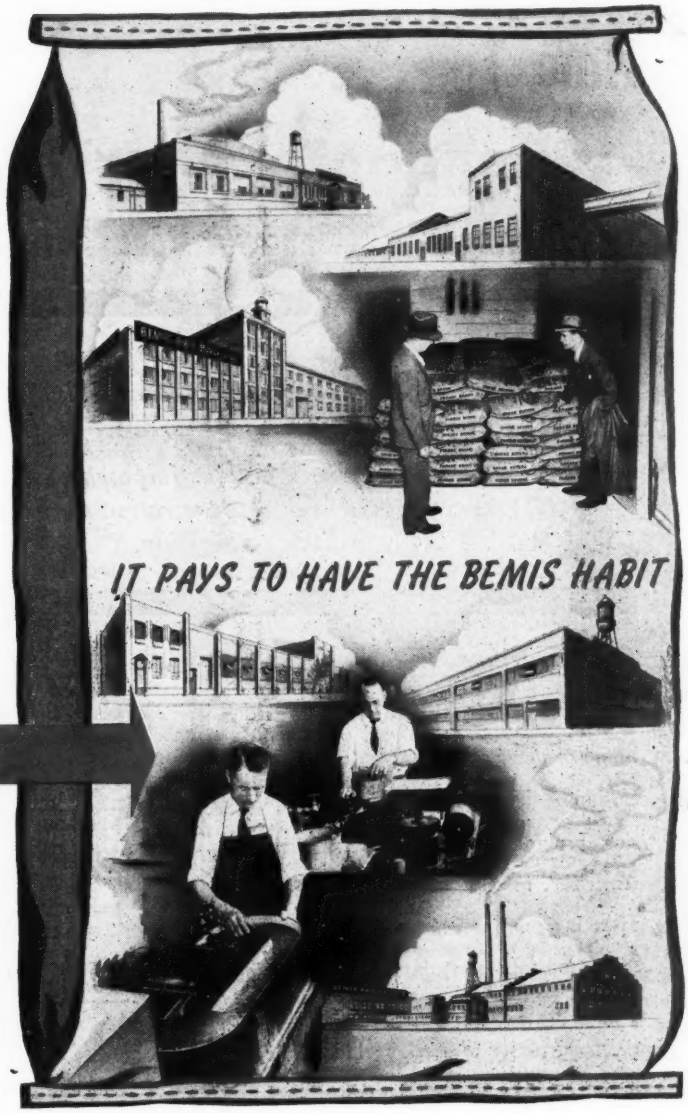

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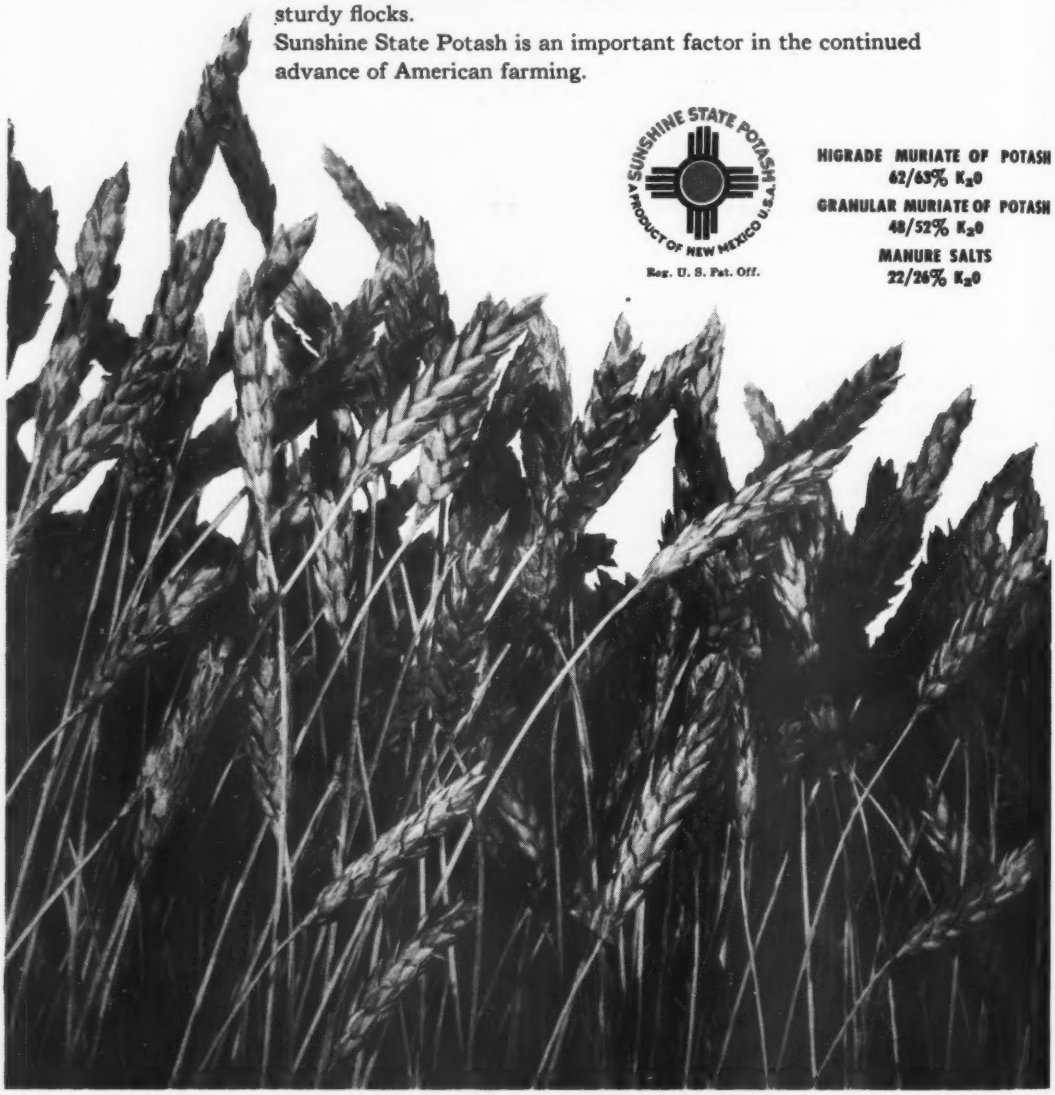

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The American FERTILIZER

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The Function of the U. S. Department of Agriculture in Collecting and Analyzing Fertilizer Statistics*

By A. L. MEHRING[1]

The work of the Division of Soils, Fertilizers and Irrigation of the U. S. Department of Agriculture, which will hereafter be referred to merely as the division, includes investigation of resources, supplies, production, consumption and trade relations of all types of fertilizers and liming materials. It is also the duty of the division to answer daily large numbers of inquiries on many phases of fertilizer technology and usage. Many years ago it became apparent that these duties could not be performed properly without more detailed statistics than were then available. Accordingly, this division undertook the compilation of the needed information. The work of the division is primarily scientific research and no statistics are collected merely for their own sake. Many of the problems that face the division for solution, however, can only be attacked scientifically and with any promise of success with the tools provided by statistical methods.

The purpose of this paper is to describe briefly the statistical work of the division and how it ties in with similar work by other agencies.

[1] Senior Chemist, Division of Soils, Fertilizers, and Irrigation, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Maryland.

*A paper presented at the Beltsville Fertilizer Conference, January, 1947.

†Figures in italics refer to Literature Cited at the end of the article.

Fertilizer Consumption

The fertilizer statistics most important to agriculture are probably those relating to consumption. An estimate of the total tonnage consumed in each state has been prepared annually by The National Fertilizer Association. These data are available for all years from 1910 to 1945, inclusive. As so fully explained by Dr. Fudge in the preceding paper on this program, many fertilizer control officials and some agronomists and soil scientists have collected detailed data annually on the consumption of the various kinds of fertilizers within their own State for many years, in some cases for more than half a century. The National Fertilizer Association and this division have also made some detailed surveys of consumption on a national basis.

The division made its first survey of fertilizer consumption by grades and of plant food consumed in cooperation with The National Fertilizer Association for the year ended June 30, 1934 (*20*).† Another joint survey was made 5 years later in the same way. When World War II started, the need for such data became so urgent that a circular on fertilizer consumption was issued in 1941. This was based partly on State tonnage reports. Additional surveys based on questionnaires sent to all fertilizer manufacturers have been made annually starting with the fiscal year ended June 30, 1943.

These surveys have shown the total consumption of fertilizers in each State and region, the most important grades of mixed fertilizers, the quantities of the various materials used as fertilizer and the consumption of nitrogen, phosphoric oxide and potash. They have pointed out changes that occurred since previous surveys were made and explained the trends in consumption.

Carter (*2*) of the Field Service Branch of the Production and Marketing Administration compiles statistics on the consumption of liming materials by States. The National Lime Association (*21*) also publishes an annual statement of the tonnages of the principal liming materials consumed in each State.

As a matter of permanent policy it is believed that this division should not collect statistics directly unless they cannot be otherwise obtained on a satisfactory basis. National figures on plant-food consumption are of such importance to the agricultural interests of the country and to the work of this department, however, that it will be necessary in the immediate future to continue collecting such data for at least a part of the States. In later surveys it is planned to send questionnaires only to the members of the industry selling in States that do not promptly publish figures on a basis that can be readily compared with that of the majority of the States. It will therefore be a real help to this division, if fertilizer control officials publish their grade tonnage reports for two periods annually ending June 30 and December 31 and itemize each grade and kind of fertilizer as fully as practicable.

The logical source of fertilizer tonnage data is the State fertilizer control office. If all States adopt the model fertilizer bill proposed by the Association of American Fertilizer Control Officials, figures will be collected and published on a basis satisfactory not only for the effective enforcement of the State fertilizer laws, but for most other purposes as well.

When all States publish comparable data, the function of this division with regard to fertilizer consumption statistics will be simplified. It will then only be necessary to collect the State reports, to compile annually regional and national totals, to analyze them, and to interpret the results. Thus more accurate figures will be available than have ever been obtainable in the past and without duplication of effort and expense and consequent annoyance to those who have to fill out more than one questionnaire on the same subject. The resulting analyses should show where uneconomic practices prevail and whether manufacturers and farmers are using and benefiting from the discoveries and inventions that research has provided.

Fertilizer Composition

This division has found it necessary for many years to study the composition of mixed fertilizers and fertilizer materials more or less on a continuing basis because conditions are constantly changing and accurate data on composition are indispensable for almost every other kind of study of fertilizers.

An example of such studies (*13*) gives the average available P_2O_5 content of superphosphate sold annually in each State from 1926 to 1938 and for the United States from 1880 to 1937. The U. S. average for certain years is as follows:

Year	Available P_2O_5 Per Cent
1880	11.01
1890	13.80
1900	13.98
1910	15.68
1920	16.66
1930	17.47
1940	19.02
1945	20.18

Another example (*18*) of statistical work on the composition of fertilizer gives the minimum, maximum, and average lime, magnesia, sulphur and chlorine contents of practically all materials used as fertilizer in the years between 1920 and 1937.

It seems desirable to have someone study the annual chemical analysis bulletins of the various States and to publish the findings for the benefit of all concerned. Control officials naturally want to know about the findings of their co-workers in other States but do not ordinarily have the time or facilities to collect the reports of the other States and analyze them. A few examples follow of what may be learned in this way. This division has learned by making such studies that manufacturers in some sections of the country regularly give larger overruns on their guarantees than in others. Clever tricks are sometimes uncovered. Unusual materials are analyzed or unusual determinations are made on ordinary fertilizers. New products are announced.

The quantity and kind of fertilizer consumed in a given area depend upon the kind

of soil, the crops grown, the climate and the system of farm management. Under farm management are included such factors as growing legumes in rotation, manuring, liming, etc.

For more than half a century the State Experiment Stations and this Department have experimented with fertilizers and have made specific recommendations, based on the results of these experiments, on how to fertilize all the major crops on various soils and under different farming systems. Although we know many farmers do not follow these recommendations, we do not know how many do, or exactly what practices are followed.

Brodell and Cooper (*1*) of the Bureau of Agricultural Economics have published the results of studies on factors affecting fertilizer consumption. As a result of this work it has been known for some time that the high-valued crops, such as fruits and vegetables, used much more fertilizer per acre than field crops. Ibach (*7*) and others of the Farm Management Division of that Bureau are also doing work of value to this division.

The National Fertilizer Association has made several surveys of fertilizer practice (*5, 26*). These throw considerable light on the subject and provide the data for some interesting further statistical analyses. Several such further analytical studies have been made by this division, using the 1938 survey data. One of these (*6*) determined requirements for nitrogen in the Southeastern States during the shortage induced by the war.

Fertilizer consumption data on a State-wide basis are not entirely satisfactory for analysis of the relationships of plant-food consumption to other agricultural factors by complex statistical methods. The reasons are fairly obvious. A State is so large an area that too many factors are varying at the same time. Therefore it is not possible to get enough pairs of data to work out satisfactorily by means of partial correlation the effects of the various factors, except where the effect is very pronounced. In spite of this fact, data on a State basis were used to work out the relationship between nitrogen consumption per acre of crop land and the percentage of nitrogen already present in the soil (*16*). Because of the close relationship of these factors the data were satisfactory and the study revealed some interesting facts, such as a strong indication that the West North Central States will not be a large market for nitrogen if farm prices drop to the prewar level.

If county consumption data by grades were available for more States they would be highly useful in statistical work. As compared with the average State many counties are fairly uniform in climate, general soil classification, kind of crops grown and farm management practices. With data on plant-food consumption for hundreds of counties in different parts of the nation to select from, excellent material would be available for partial correlation studies. It is believed that such studies would throw a lot of additional light on farm fertilizer practices.

Industry Practices

As a result of discoveries, inventions and economic changes, new practices develop in the manufacture of fertilizers that are beneficial and highly desirable. At other times undesirable practices develop as a maladjustment to new discoveries. An example is that of using filler which has been fully treated in a previous paper on this program.

When secondary and minor element deficiencies were discovered to be limiting crop production in certain areas, fertilizer manufacturers quickly took steps to correct them by adding sources of these elements to mixed fertilizers for use in the deficient areas.

One of the elements frequently limiting crop production in the United States, other than nitrogen, phosphorus or potassium, is magnesium. Two statistical studies of the use of magnesium in agriculture have been completed in this division. The first study (*12*) covered the period before 1937. The second was reported at the meeting of the American Chemical Society in September, 1946, and the report is still in process of publication. Some statistics have also been gathered by the division on the usage of manganese sulphate, and similar materials.

It was discovered some years ago that changes in industry practices had caused commercial fertilizers to become decidedly acid in their physiological effect upon the soil (*19*). In some areas this was of no importance, but in sections where soils were already highly acid and farmers do not customarily lime their soils it was extremely important. The publicity resulting in 1933 and 1934 from the discovery of this condition rapidly brought about improvement as may be seen from Fig. 1. The average fertilizer has become more acid-forming again, however, in the past few years.

It requires considerable technical training and knowledge of fertilizer technology to make

satisfactory statistical studies of fertilizer industry practices. Studies of this character are usually based on statistics collected primarily for other purposes. They can be made best by organizations with personnel well grounded in fertilizer technology.

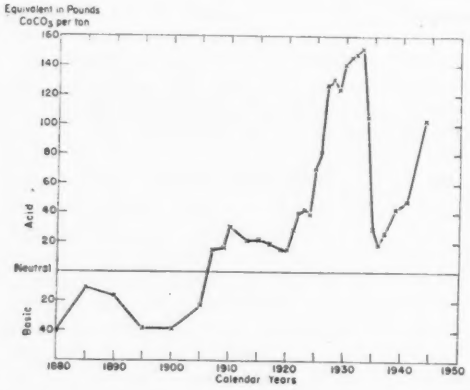

Fig. 1. Average potential acidity of mixed fertilizers

Fertilizer Supplies

Supplies of plant food depend upon production, imports and exports of many different materials. Statistics are regularly published on the production of a few of the more important fertilizer materials, such as ammonium nitrate, by-product ammonium sulphate, superphosphate, and muriate of potash by the Bureau of the Census and the Bureau of Mines. During the War the War Production Board collected data on the production of all chemical nitrogen materials. No production data on the various organics or some of the phosphate and potash materials have ever been published except those collected by this office. The production of all fertilizers, imports and exports of fertilizers and some other valuable data are regularly provided by the Department of Commerce.

Nearly all materials used as fertilizer are used for other purposes as well. For example, sodium nitrate is used for meat curing, glass manufacture and many other uses besides fertilizer. In recent years some superphosphate has even been defluorinated and used for feed. These facts greatly complicate interpretation of the published data.

For many years the Department of Agriculture has gathered together the available production, import and export data. Such data have been published annually by the Bureau of Agricultural Economics (*28*). Other agencies in the Production and Marketing Administration have also provided data on supplies. This division at times has secured production data directly from the manufacturers for the less important materials about which other organizations were not interested, such as process tankage, and double superphosphate (*14*) before 1943, when the War Production Board started collecting data for this material. The final steps in this process are to analyze and interpret the accumulated data. An analysis of this kind was made by Jacob (*8*) on the production and supplies of superphosphate in 1940 and 1941. Another example is a recent study of ammonium nitrate by Scholl, which is in process of publication.

Fertilizer Resources

The Geological Survey and the Bureau of Mines compile basic statistics of the mineral reserves of phosphate rock, potash salts, sulphur, limestone, gypsum, and some other mineral materials that are part of out plant-food resources (*29*). From such basic data Jacob (*10*) made an analysis of the phosphate rock reserves of the United States.

Many other kinds of plant-food resources exist, however, besides mineral deposits. These resources include the quantities of nutrients already in our soils or which can be made available to agriculture from the underlying subsoil and rocks. The plant nutrients contained in imported food and feed, in industrial wastes, sewage, etc., are actual or potential plant-food resources. The quantities of nutrients removed from soils by crops, erosion and leaching and returned in the form of crop-residues or added by nitrogen-fixation, in the form of materials brought down in rainfall, as fertilizers, soil amendments, and animal manures all affect the long time resources of agriculture. Many studies of these problems have been made by agronomists and soil scientists by various methods of approach, some of which are statistical. Inasmuch as the purpose of the present paper is to discuss the statistical work of the Department of Agriculture, only a few samples will be given of such work.

In 1944 a cooperative study was undertaken by agronomists of several eastern States and of this division to determine the nutrient status of potato soils (*4*). This work has shown that in all the Atlantic Seaboard States more phosphorus was added annually to potato soils by applications of commercial fertilizer than was removed in the crop.

(Continued on page 24)

Lion Oil Company Plans New Developments

Col. Thomas Barton, President, Announces Construction of New Oil Refining and Ammonium Nitrate Producing Facilities

The office of Col. Thomas Harry Barton, president of the Lion Oil Company in El Dorado, Arkansas, is filled with seventeen miniature lions of all shapes, sizes and materials (wood, iron, bronze, glass, china, etc.). The office is also full of optimism. Says Col. Barton, "Petroleum and natural gas are being put to more uses today than ever before. There are more automobiles operating now than at any previous time. More farms are being mechanized. Diesels are becoming more widely used and so is oil heating for homes. In fact, the demand for our petroleum products is so great that we're hard put to meet it and in our chemical operations we can't begin to supply the quantity of products for which we are asked. At our chemical plant we have just put into operation one major new unit and another unit will be finished very shortly."

Lion expects sales to top $50,000,000 this year with earnings of about $5.00 a share. This contrasts with average sales of $10,500 during the 1936–1940 period. Present profits are divided about equally between the oil and chemical departments. The company controls 12,000 acres of oil-producing lands in Arkansas, Texas, Kansas, Louisiana and Mississippi, with an additional 587,000 acres of undeveloped properties in these States and in Alabama, New Mexico, Colorado and Wyoming. The modern refinery at El Dorado has a capacity of 20,000 barrels daily and serves a marketing chain of 100 bulk plants and 1,348 retail outlets.

Lion's Boss

Head man of the outfit is Col. Barton (War I) who professes: "I know nothing about the business, but hire people who do." His employees say: "Just make an incorrect statement in his presence and he'll be the first to pick it up." The 65 year old oilman is a Texan from way back—his grandfather was the first sheriff of Falls County and issued himself the first marriage license; his father was the first white child born there. The Colonel's first job was checker for the old Pacific Express in Texarkana, Arkansas at $10 a week and later $15. Then followed stints as insurance salesman and lumberman.

When the Busey Well came in, the Colonel hastened to El Dorado and formed the El Dorado Natural Gas Company with some of his friends. In 1929 he became Lion's president. Today he is president or chairman of seven companies (Little Rock radio station KARK, Exchange Bank & Trust, Paraffin Melting, etc.) is active in four oil associations and a member of 22 councils, clubs and associations. As a hobby he collects pistols; he has 90 including two of the oldest type Chinese arms. Grinned a friend: "Last year he hit a buck at 200 yards on the run." To promote improved livestock in Arkansas he started its Live Stock Show Association in 1937, has since served as president in every year but one. Active in politics the Colonel ran for Senator a few years ago. In Southern tradition, the Colonel and his gracious, blue-eyed wife enjoy entertaining in their colorful gardens of azaleas, camellias, cape jasmine, roses, etc.

Col. and Mrs. Thomas Harry Barton

(Continued on page 22)

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Cotton Report

An 11,508,000 bale cotton crop is now forecast by the Bureau of Agricultural Economics, based on information as of October 1st. This is 341,000 bales, or 3 per cent, less than the forecast as of September 1st. From Alabama westward through Oklahoma, continued dry, hot weather reduced prospects for the late portion of the crop and more than offset generally favorable weather in Georgia and the far western States. The indicated 1947 crop compares with 8,640,000 bales produced in 1946 and the 1936–45 average of 12,390,000 bales.

Lint yield per acre is now computed at 261.3 pounds—26 pounds above that harvested last year, and 10.7 pounds above the 10-year average. The record yield per acre for the United States of 298.9 pounds was produced in 1944.

STATE	Average 1936–1945	1946 Crop	1947 Crop indicated[1] October 1
	Thousand bales	Thousand bales	Thousand bales
Missouri	365	307	340
Virginia	26	17	18
N. Carolina	597	440	450
S. Carolina	765	697	660
Georgia	917	557	655
Florida	20	6	10
Tennessee	528	520	510
Alabama	1,003	822	965
Mississippi	1,787	1,047	1,600
Arkansas	1,394	1,281	1,325
Louisiana	639	247	500
Oklahoma	568	262	275
Texas	3,021	1,699	3,150
New Mexico	115	142	150
Arizona	186	158	210
California	442	458	680
All Other[2]	18	10	10
United States	12,390	8,640	11,508
Amer. Egypt[3]	32.1	2.5	1.1

[1]Allowances made for interstate movement of seed cotton for ginning.
[2]Illinois, Kansas, and Kentucky.
[3]Included in State and United States totals. Grown principally in Arizona, New Mexico, and Texas.

The Bureau of the Census reports 3,898,767 bales ginned from the crop of 1947 prior to October 1st compared with 2,334,443 bales for 1946 and 2,177,768 bales for 1945.

No estimate of cottonseed production will be made until final ginnings for the season

are released. If the ratio of lint to cottonseed, however, should be the same as the average for the past five years, production would be 4,669,000 tons. Production in 1946 was 3,513,000 tons and the 10-year average 5,143,000 tons.

Fertilizer Placement Machinery Slides Being Collected

The National Joint Committee on Fertilizer Application is making a collection of 2 inch by 2 inch colored slides of illustrations of modern fertilizer placement machinery. This work, which is being done by the Subcommittee on Farm Machines for Fertilizer Placement, will meet a demand from individuals and organizations for illustrations of current machinery development.

The original of each slide will be retained as a master slide and duplicates will be made on order at the actual cost which now is 20 cents per slide. As soon as the file is established, it will be maintained by the secretary of the Joint Committee in the offices of the National Fertilizer Association, Washington, D. C. A catalog will be prepared from which selections can be made.

Anyone having slides to contribute to this file is asked to send them to the Subcommittee Chairman, Glenn A. Cummings, Agricultural Engineering Laboratory, Bureau of Plant Industry, Soils and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Maryland.

Potash Production for Second Quarter of 1947

North American potash deliveries by the five major American potash producers continued at a high level during the second quarter of 1947, totaling 474,656 tons of potash salts containing an equivalent of 259,595 tons of K_2O, the American Potash Institute has announced. This included French imports into the United States but not into Canada. It represented an increase of 22 per cent in salts and 18 per cent in K_2O over the tonnage delivered during the corresponding period in 1946. Deliveries for agricultural purposes in the United States, Canada, Cuba, Hawaii, and Puerto Rico (Institute countries) amounted to 441,092 tons of salts equivalent to 238,678 tons of K_2O, consisting of 211,890 tons as muriate, 8,756 tons as manure salts, and 18,032 tons as sulphate of potash and sulphate of potash-magnesia. Deliveries for chemical purposes amounted to 31,338 tons of salts, equivalent to 19,553 tons of K_2O. Exports to other than Institute countries totaled 1,364 tons K_2O, about the same as last year.

During the first six months of 1947, total North American deliveries, including imports amounted to 993,410 tons of salts containing an equivalent of 536,280 tons K_2O. This represented an increase of 16 per cent in salts and 12 per cent in K_2O over the same period in 1946. Deliveries of potash for agricultural use in Institute countries totaled 921,225 tons of salts with an equivalent of 491,414 tons of K_2O, an increase of 17 per cent in salts and 12 per cent in K_2O over last year. Making up these agricultural deliveries were 434,157 tons K_2O as muriate, 21,606 tons K_2O as manure salts, and 35,651 tons K_2O as sulphate of potash and as sulphate of potash-magnesia. The chemical industries took 61,593 tons of potash salts containing an equivalent of 38,439 tons of K_2O, a 10 per cent increase over the first half of 1946. Exports to other than Institute countries amount to 6,427 tons K_2O, about 2 per cent over last vear.

Plant Food Research Project Approved

Scientists of the State experiment stations and the U. S. Department of Agriculture will study mineral deficiencies of the nation's soils in a project approved under the Research and Marketing Act of 1946, it was announced on October 6th.

The investigation is designed to develop basic information on plant food needs in the soil and to make possible better returns from fertilizers. The scientists will study the influence of fertilizers on the nutritive value of plants.

Three phases of work are planned by the Bureau of Plant Industry, Soils, and Agricultural Engineering in cooperation with the experiment stations for the coming year. One is concerned with phosphate requirements for crop and livestock production in the West. Another deals with phosphorus, both organic and mineral, in the prairie soils of the Corn Belt. A third provides for investigation of mineral deficiencies and the influence of fertilizers and lime on the yield and quality of forage in the Northeast. The basic research in chemistry will be done at Plant Industry Station at Beltsville, Maryland.

E. A. Meyer, administrator of the Research and Marketing Act, points out that

the research is in answer to a rapidly increasing need for improved plant food recommendations based on soil composition, soil management practices on the farm, and simplified soil-testing procedures.

October Crop Report

A corn crop of 2,458,574,000 bushels was predicted by the U. S. Department of Agriculture in their report on crop conditions as of October 1st. This is an increase of 54 million bushels over the September 1st estimate but is still 25 per cent below the great 1946 crop of 3,288,000,000 bushels. It is also below the 10 year (1936–1945) average of 2,639,000,000 bushels.

The wheat crop this year will set a new record of 1,408,000,000 bushels which is 22 per cent above the 1946 harvest. Most of this increase was in the winter wheat crop.

Other crops showing notable increases were rye, flaxseed, sugar beets and pecans. On the other hand, smaller crops of oats, soybeans, potatoes and tobacco were reported.

	Estimated October 1 (Thousands)	Harvested 1946 (Thousands)
Wheat (bu.)	1,406,761	1,155,715
Winter (bu.)	1,095,648	873,893
Spring (bu.)	268,096	245,986
Durum (bu.)	43,017	35,836
Corn (bu.)	2,458,574	3,287,927
Oats (bu.)	1,231,561	1,509,867
Barley (bu.)	284,497	263,350
Rye (bu.)	24,405	18,685
Buckwheat (bu.)	8,182	7,105
Flaxseed (bu.)	39,980	22,962
Rice (bu.)	76,718	71,520
Sorghums (bu.)	85,696	106,737
Hay (tons)	101,804	100,860
Beans (100 lb. bags)	16,314	15,797
Peas (100 lb. bags)	6,542	6,926
Soybeans (bu.)	180,985	196,725
Peanuts (lb.)	2,102,260	2,036,430
Potatoes (bu.)	378,099	475,969
Sweet Potatoes (bu.)	59,208	66,807
Tobacco (lb.)	2,151,356	2,312,080
Sugar Cane (tons)	5,743	5,997
Sugar beets (tons)	12,248	10,562
Apples (bu.)	112,910	119,410
Peaches (bu.)	83,857	86,643
Pears (bu.)	35,048	34,447
Grapes (tons)	3,049	3,120
Cherries (tons)	183	230
Apricots (tons)	196	339
Cranberries (barrels)	743	857
Pecans (lb.)	100,206	76,706

August Sulphate of Ammonia

Production of by-product sulphate of ammonia went up 6 per cent during August, totaling almost 70,000 tons, according to the figures of the U. S. Bureau of Mines. This brings total output for the first eight months of the year to 531,805 tons, an increase of 34 per cent over the same period of 1946. Shipments during August increased 13 per cent over July and were a few hundred tons greater than production. As a result stocks on hand at the end of the month remained about the same and totaled 25,318 tons.

	Sulphate of Ammonia Tons	Ammonia Liquor Tons NH_3
Production		
August, 1947	69,948	2,103
July, 1947	66,018	2,192
August, 1946	65,250	2,236
Jan.–Aug., 1947	531,805	17,174
Jan.–Aug., 1946	396,609	15,783
Shipments		
August, 1947	70,341	1,899
July, 1947	62,050	2,096
August, 1946	73,324	2,088
Stocks on Hand		
Aug. 31, 1947	25,318	632
July 31, 1947	26,229	583
Aug. 31, 1946	38,609	733

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FERTILIZER MATERIALS MARKET

NEW YORK

Organic Market Continues Strong with Supplies Scarce and Prices beyond Reach of Fertilizer Manufacturers. Boxcar Shortage Hampers Movement of Materials. No European Potash Expected for Current Season. Better Supply of Nitrogen Solutions

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, October 15, 1947.

The organic market continued strong due to lack of offerings. Some fertilizer manufacturers are starting their mixing operations and need organics and will definitely be short. Animal tankage continued to sell at $1.50 per unit of ammonia ($13.98 per unit N) with very little offered; blood sold at $10 ($12.16 per unit N). Some vegetable meals were slightly easier in price because the new crop material is starting to move as farmers bring their soybeans and cottonseed to market. However, the feed people were eager buyers and the market, after dipping in price slightly, rallied and last sales of soybean meal for November were made on basis of $80.00 per ton f.o.b. Decatur, Illinois. Fish meal advanced in price as the fishing season is about over in the North and last sales of fish meal were made at $140.00 per ton which is almost too high for fertilizer.

Low grade organics were moving out on season's contracts and very little material was offered for sale for spot shipment.

Sulphate of Ammonia

Some producers are experiencing trouble in securing necessary boxcars and most of the material is being shipped as fast as it is produced. The supply is still far short of buyer's requirements. Some inquiry is noted for export but permits are still required and the Government has already allocated various countries their quotas.

Potash

This material is still in heavy demand for all sections and while it was thought sometime ago that some foreign material might be imported, the chances of any of this material coming into this country in the near future are rather dim, due to heavy requirements on the Continent.

Superphosphate

Shipments are moving well against contracts with the start of the mixing season. There is an urgent demand for triple superphosphate for both domestic and export, and as the producers have already contracted for their available supply, these demands cannot be filled.

Nitrogen Solutions

Reports were heard in the trade that this material was in a little better supply and producers were able to make shipments on contract on an even basis.

Bone Meal

The demand from fertilizer manufacturers is increasing and while some steamed bone meal was available at several points, the supply of raw bone meal was very scarce.

Castor Pomace

The production of this material is still retarded due to plant difficulties and lack of castor beans. No sales have been reported in some time although buyers are eagerly seeking supplies.

Nitrate of Soda

This material was still scarce although the demand for this material at this time of year is not as heavy as in the spring when it is needed for top-dressing. Producers were doing their best to keep up with demand.

Nitrogenous Tankage

Producers are still sold up on contract and no new trading was reported. Most producers have been unable to increase their production due to shortage of raw materials.

PHILADELPHIA

Transportation Problems Hamper Materials Producers. More Domestic Nitrate of Soda for Agricultural Use. Some German Potash Offered

Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA, October 13, 1947.

Boxcar shortage is said to be causing serious delay in the delivery of raw fertilizer materials to mixers, tending to emphasize the present tight supply position. It is expected that the total output of mixed fertilizers during the 1947–1948 season will not greatly exceed the 1946–1947 tonnage. This is due mainly to shortage of materials, since the production capacity is considered ample, and further construction is progressing in many directions.

Sulphate of Ammonia.—Demand continues active and producers are reported several weeks behind in deliveries.

Nitrate of Soda.—It is expected that the United States will get as much Chilean nitrate as last season, and whereas industry has been absorbing almost the entire production of domestic nitrate, it is reported that a considerable quantity of domestic has been allocated for agricultural use.

Ammonium Nitrate.—Present supply continues short of demand.

Castor Pomace.—No free offerings reported. Nominal price, $40.00.

Fish Scrap.—Fishing operations are expected to wind up in another week or two. Meanwhile the market continues strong and not much offering.

Tankage, Blood, Bone.—At this writing the organic market is weaker. The price of $12.00 per unit of ammonia ($14.59 per unit N) is nominal only, as buyers are not interested in this figure. Quite a few cars of tankage are offering but the feeding people seem to have again backed out of the market. There is fairly active inquiry from fertilizer mixers, but they cannot pay feeding prices. Bone seems to be easier as feed mixers are turning to substitutes.

Phosphate Rock.—Production is practically under contract, and movement to fertilizer plants is said to be behind schedule. Shortage of cars is still a disturbing factor.

Superphosphate.—Market continues firm with the supply rather tight in this area, and no free offerings visible.

Potash.—Supply continues insufficient to meet present demand, and shipments are delayed on account of scarcity of boxcars. A grade of muriate lower than normal quality is said to be available for prompt shipment from occupied Germany. While the tonnage is said to be fairly substantial, the price is very much higher than the domestic material.

CHICAGO

Fertilizer Manufacturers Resist Present Prices on Organic Materials. Demand Still Strong in Feed Market

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, October 11, 1947.

The organic material market is very dull and uninteresting. The sellers had a small tonnage to move for winter shipment and had no difficulty in getting their full price. As previously mentioned, the large mixers insist that present prices are too high and undoubtedly they can utilize other organic material which the smaller mixers prefer not to use.

In the by-products feed market, the demand continues very strong for wet rendered tankage at $11.50 to $12.00 ($13.98 to $14.59 per unit N) f.o.b. Midwest points. Dried blood was firm at around $10.50 per unit of ammonia ($12.76 per unit N) f.o.b. Midwest packing centers.

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D-3

State Wheat and Rye Goals Set for 1948

State 1948 wheat goals totaling 75,095,000 acres and rye goals at 2,458,000 acres were announced on October 3rd by the Department of Agriculture. The State totals only slightly revise the national goals announced on July 31st. These revisions followed review of suggested goals in the States and become the wheat and rye goals for 1948.

The total of the wheat goals recommended by State goals committees is approximately 4,000,000 acres more than goal of 70,700,000 acres set for 1947 but is nearly the same as the 1947 indicated plantings, excluding volunteer wheat. The 1947 acreage for harvest of 77,059,000 acres was made up of approximately 75,000,000 acres seeded and 2,000,000 acres of volunteer wheat. About 70 per cent of the total will be planted to winter wheat, and the remainder to spring wheat. Yields equaling those of the last few years would produce on the 1948 acreage the fourth successive crop of more than a billion bushels.

Sum of the State rye goals is 505,000 acres more than the acreage harvested in 1947. This increase is considered necessary in view of the prospective demand for rye in 1948. The production of rye has been below domestic and foreign requirements in recent years.

State	Wheat		Rye	
	1947 Indicated Planted Acreage	1948 Goal	1947 Indicated Harvested Acreage	1948 Goal
	(Thousands)		(Thousands)	
Maine	1	2	..	..
N. Y.	404	400	14	15
N. J.	97	100	15	15
Pa.	947	1,000	19	45
Ohio	2,219	2,300	26	35
Ind.	1,594	1,700	72	80
Ill.	1,404	1,600	46	50
Mich.	1,228	1,250	65	65
Wis.	119	125	85	85
Minn.	1,226	1,300	153	160
Iowa	161	200	10	15
Mo.	1,628	2,300	38	40
N. Dak.	10,435	9,500	307	500
S. Dak.	3,905	3,900	323	450
Nebr.	4,484	4,450	289	300
Kans.	14,994	14,250	57	75
Del.	67	70	22	20
Md.	399	405	19	20
Va.	499	500	25	30
W. Va.	100	100	3	5
N. C.	507	600	23	35
S. C.	230	325	12	13
Ga.	245	275	5	20
Ky.	419	450	40	50
Tenn.	379	400	24	35
Ala.	14	15	..	..
Miss.	26	25	..	..
Ark.	39	48	..	..
Okla.	6,785	6,750	53	65
Tex.	7,807	7,220	32	35
Mont.	4,848	4,200	38	40
Idaho	1,348	1,300	4	6
Wyo.	283	280	10	10
Colo.	2,375	2,300	47	60
N. Mex.	566	450	5	5
Ariz.	30	35	..	..
Utah	319	320	8	8
Nev.	24	20	..	..
Wash.	3,107	2,800	10	16
Ore.	1,038	1,030	41	42
Calif.	759	800	13	13
U. S.	77,059	75,095	1,953	2,458

Exports of Ammonium Nitrate Resumed

Due to the urging of the Office of International Trade, the U. S. Coast Guard has permitted the shipment of ammonium nitrate by private industry to be resumed on October 15th at Port Tampa, Florida. It is expected that about 4,000 tons per week will move out of the port when loading starts. Because of

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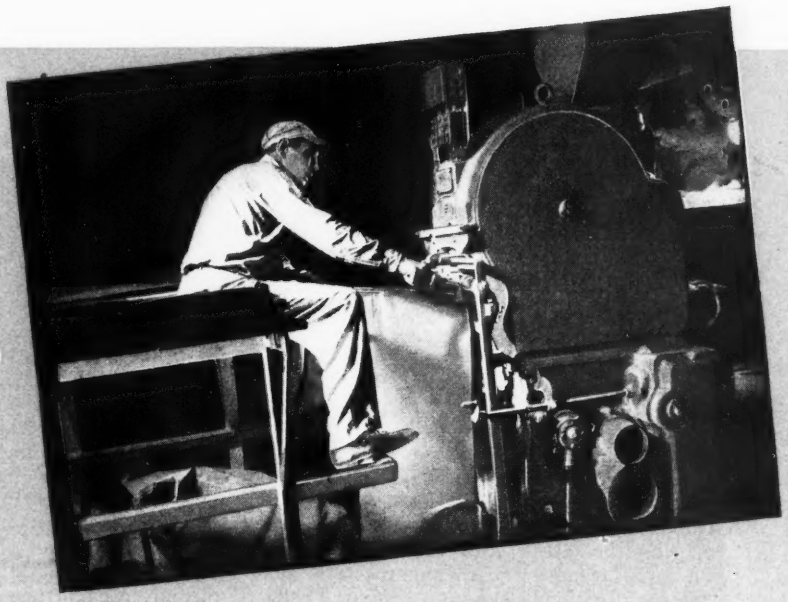

On a straight run of a single grade of fertilizer, an output as high as 36 tons per hour is common with a St. Regis 160-FB packer. Only *one operator* is required. The packer automatically fills and weighs the self-closing multiwall paper valve bags.

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a shortage of storage facilities, the Interstate Commerce Commission has been asked to permit the material to remain in the cars, in which it was shipped from the producing plant, until it is transferred to the vessels, without payment of the stiff demurrage charges that would ordinarily apply.

New Construction Features Chase Bag Centennial Year

This year, with 100 years of manufacturing experience behind them, the people of the Chase Bag Company are celebrating an anniversary that few, whether individuals or business organizations, survive to enjoy. In commemorating its Centennial, this company, quite naturally, likes to recall the memories of its beginning and growth during vivid and memorable episodes in our country's history.

When founder Henry S. Chase left Harvard University in 1847, the newspapers were carrying headlines such as "General Zach Taylor Captures Two Mexican Towns" and "Post Office Department to Sell Postage Stamps." It was in that historical year that Henry Chase began what was to become the Chase Bag Company of today. While looking for a job along the Boston waterfront, young Henry Chase approached a trader who, after hearing the story of this ambitious youngster, told him that even though he had no regular job available, he might be able to help. He led the young man to a loft and pointing to a disordered pile in a dimly lighted corner, he said, "These are bags, son, West Indian gunnies; we receive cocoa in them. Our customers return the empties, I give them credit and then sell them. The whole business is more bother to me than it is worth, but if a young fellow could work at it, he could make a good living." That encouragement was all that Henry Chase needed. Overflowing with ambition, he rented space in a Boston loft and the Chase Bag Company was born.

In those days bags were not a common container. Those used were hand cut, hand sewn and quite expensive when compared to barrels and kegs which could be re-used many times.

Henry Chase, nevertheless, found a ready market for his bags and after making the acquaintance of a Boston printer, they developed a method of printing brands on bags and the Chase Bag Company was well established. From that insignificant nucleus in a Boston waterfront loft the Chase Bag Company has developed into a modern and efficient organization serving a myriad of industries with its coast to coast service.

Today as headlines of the United Nations' Organization and heretofore unknown nationwide strikes are perhaps making history, a company with 100 years experience continues to forge forward. During 1947 the Chase Bag Company has completed the construction of three modern factories and a factory addition, each of which utilizes today's most widely discussed method of heating. This heating system is known as radiant heating, which in the last ten years has met with widespread acceptance for all types of construction in this country.

In designing these new plants, Chase officials aimed their architectural sights at achieving layouts which would combine maximum production efficiency for the company's type of manufacturing, with a high degree of comfort and convenience for employees.

After considerable research and study of existing plant operations, it was decided upon by engineers and industry officials that a one-floor bag plant was the most efficient structure in which bag manufacturing could function. From these observations plans were drawn for the new one-floor plants at Crossett, Arkansas, Minneapolis, Minnesota, and St. Louis, Missouri. Since a large percentage of the company's employees are women, considerable attention was devoted to the heating system. Radiant heating was specified because it attacks the heating problem in an entirely different way and establishes ideal draft-free comfort. In all these newly constructed plants, warmth is distributed uniformly over all areas regardless of size.

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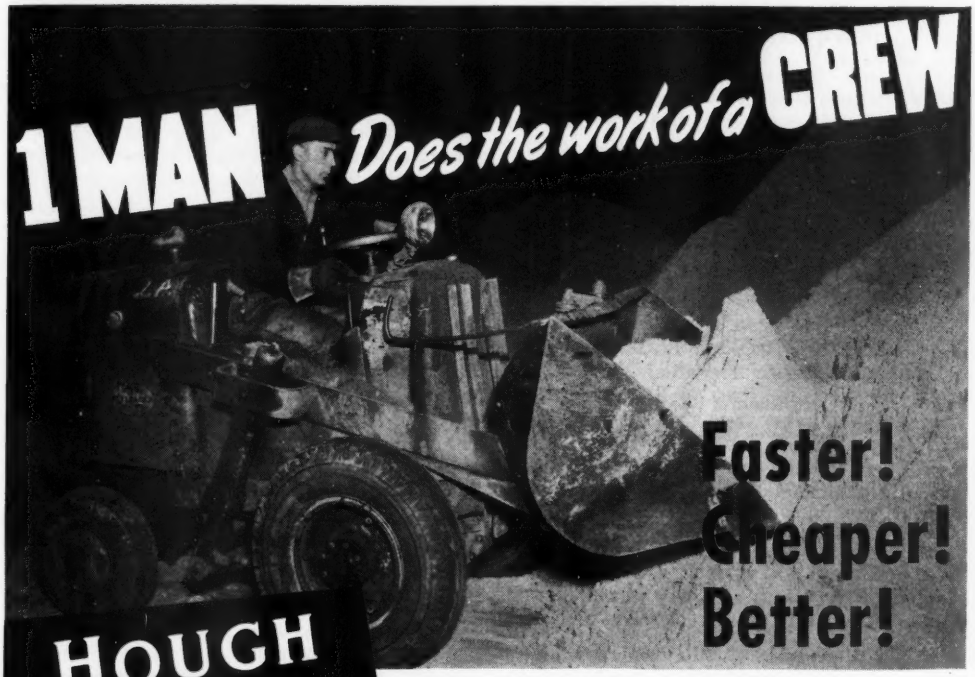

HOUGH "HUFF" Payloaders PATENTED

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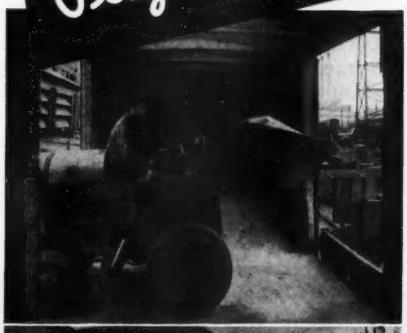

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Wisconsin Pasture Tests Show Value of Adequate Fertilizer

The results of demonstrations conducted in 1945, 1946 and 1947 in six northern Wisconsin counties have proven conclusively that ammonium nitrate, applied as a top dressing during April and May at a rate of 150 to 200 lb. per acre, can be expected to produce from three-quarters to one and one-half tons more hay per acre. In addition, the protein content and feeding value of the fertilized hay is improved.

During 1947, the average increase of 77 plots, where the 200 lb. application was used, came to 1,819 lb. per acre which showed a net profit over fertilizer cost of $12.19 per acre. The individual increases ran from a low of 75 lb. to a high of 3,600 lb. The latter showed a profit of $30.00 per acre on a fertilizer expenditure of $6.00.

Where small increases were shown, the trouble was usually caused by a lack of phosphorus and potash in the soil. Where these elements were also added, the increases were in line with results on more fertile soil.

On 29 plots, experiments were conducted with the ammonium nitrate reinforced by application of 250 lb. per acre of 0-20-0 or 0-20-20, to make up the depletion of phosphorus and potash by previous crops. On these plots, the average increase was 2,889 lb. per acre, or a net profit of $18.99 per acre over and above the cost of the fertilizer. Where 20 per cent superphosphate was used with the ammonium nitrate, the increases ranged from 900 lb. to 3,525 lb. per acre. When the 0-20-20 mixture was used, the increases ranged from a low of 1,650 lb. to a high of 4,875 lb. per acre. On the farm showing the maximum increase the yields per acre were as follows: No fertilizer, 2,250 lb.; ammonium nitrate only, 5,550 lb. (profit $27.00); ammonium nitrate and 0-20-0, 5,775 lb. (profit $27.37); ammonium nitrate and 0-20-20, 7,125 lb. (profit $36.07).

According to C. J. Chapman, Soils Specialist of the Wisconsin College of Agriculture, who was in charge of this experimental work, it is possible to produce, on the average farm, a ton more of better hay per acre at a cost of from $4.75 to $8.00. In many cases the yield per acre has been more than doubled, which amounts to the equivalent of doubling the size of a farmer's hay acreage.

The residual effect of the fertilizer will also result in substantial increases in the yield of clover and timothy the following year.

LION OIL CO. PLANS NEW DEVELOPMENTS

(Continued from page 11)

Col. Barton and his company thrive on new ideas and products. In May 1943, after months of planning and 18 months of construction from 6,000 square yards of blueprints, the $26,500,000 Government-owned Ozark Ordnance Works was completed and put under Lion operation. Just outside of El Dorado, the plant is tangible proof of aggressive Col. Barton's decision to get more industry for Arkansas and considerably more diversification for Lion.

Lion convinced the Government that El Dorado was a desirable site for the needed nitrogen plant. Natural gas, the only raw material required other than air and water, was readily available in the area and other conditions were favorable. The decision to build there was justified at that time and since by the fact that under Lion's operation the Ozark Ordnance Works was the most efficient of all ammonia plants which the U. S. Government owned.

At war's end Lion leased the plant from WAA in May 1946 on a rental basis with an option to purchase at any time. Today the plant uses 30,000,000 cubic feet of natural gas daily (one-third for raw material, the rest for power) to produce for sale anhydrous ammonia (24,800 tons a year), ammonium nitrate fertilizer (163,500 tons a year) and nitrogen fertilizer solutions (116,000 tons a year). The plant's location is a big advantage. The reason is simply that the twelve States around Arkansas are the States which use 60 per cent of all U. S. nitrogen used in plant foods.

Design of the plant is a big help too. Everything is so modern and automatic that productivity per workman is surprisingly high. Indeed Lion boasts that production is

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Number 1 job at the nitrogen plant is to meet the insatiable demand. The Agriculture Department estimates 1,161,000 tons of nitrogen are needed annually in 1947–1951 *v* 626,000 tons actually used in 1944 and only 62,000 tons in 1900. Spanking new additions include another nitric acid plant to jump nitric acid production 50 per cent (nitric acid plus ammonia equals ammonium nitrate). The new prilling plant will produce fertilizer with a 33.5 per cent nitrogen content *v* the present 32.5 per cent nitrogen content. This $1,000,000-plus ammonium nitrate pelleting plant was just put into operation. As a good example of Lion management the chemical plant which was built for 300 tons of ammonium nitrate a day now ships 435 tons daily (every 24 hours 8,700 fertilizer bags purchased from Southern Kraft are used).

Lion expected this production to meet a high percentage of the demand from Arkansas and ten nearby States. But based on the growing demand it appears that Lion production will provide a smaller percentage of only eight of the surrounding States' needs.

Like most other industrialists in the Southwest, Col. Barton has big plans for the future. Last week he said: "We are interested in all chemicals, particularly those which can be derived from natural gas. That includes chemicals for dyes, textiles, detergents, plastics, medicines, weed killers, dry ice—a lot of things." Added a cheerful Lion Oiler: "Come back in a year—there will be so much going on that you won't recognize the place."

FUNCTION OF U.S.D.A. IN COLLECTING FERTILIZER STATISTICS

(Continued from page 10)

Recently it was found that larger quantities of plant nutrients are added to the soils of the New England Region in manures resulting from animal feeds shipped in from the Central States than are applied in the form of commercial fertilizers (*17*).

Situations like the examples just given can be studied effectively only by statistical methods. The importance of such studies is apparent and no doubt it is the duty of this department to investigate changing farm practices as related to plant-nutrient requirements and to keep the agricultural public informed about them.

Fertilizer Prices

The relative costs of plant food in different forms vary with new discoveries and economic changes. These changes are inevitably followed by changes in manufacturing, in the buying habits of farmers, and in fertilizer practices in general. For example, a unit of nitrogen in the form of cotton seed meal or dried blood cost less in 1900 than in the form of sulphate of ammonia. Today it costs several times as much and consequently very little natural organic nitrogen is used, compared with formerly. These changes are of importance to agriculture.

The division has tried for many years to keep informed of developments in the economics of fertilizer usage and resulting commodity competition for the farmer's dollar and to relate these to fertilizer technology and methods of manufacture. One of these studies (*11*) showed that changes in fertilizer technology between 1880 and 1935 had

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lowered the cost of plant nutrients to less than half their earlier level, relative to all commodities. Other studies (*23, 24*) showed that still greater economies could be brought about by taking full advantage of discoveries and developments already in existence. Shaw, Parker and Ezekial (*25*) recently showed that changes in the proportions of chemical nitrogen, organic nitrogen, phosphoric oxide and potash consumed as fertilizer are related mathematically to the relative wholesale costs of these various plant-food materials and that by increasing by 20 per cent the concentration of mixtures, total consumption of plant nutrients would be greatly increased.

In order to make studies of the kind referred to above, reliable price data are needed. On the wholesale level such data for fertilizer materials have been quoted regularly for many years in trade journals. The Department of Labor and The National Fertilizer Association publish series of wholesale price indexes for both fertilizer materials and mixtures. The Bureau of Agricultural Economics (*27*) also has a series of retail price indexes, which show what the farmer pays for fertilizer.

Retail prices have been published annually by a few of the State control officials in their analysis bulletins. The States of Vermont, New Jersey, Pennsylvania, Indiana and Texas are the principal sources of such data. The retail price is easily obtained by the State inspector when he takes his sample for analysis and it is believed that much more widespread collection and publication of such information separately for each type of fertilizer would be of real value not only to market analysts and other scientists making economic studies but also to farmers in juding values. The latter point is particularly true when the control official analyzes the actual costs of a pound of plant food in various materials and mixtures sold in his State during the previous season and presents the data in such a way that the farmer can make easy comparisons.

Interrelationships

An important service that statisticians can render is to discover casual relationships by correlation and other statistical methods. An example of such work in the fertilizer field (*15*) shows that the amount of money spent by farmers for fertilizer is very closely correlated with the cash income from crops and government payments in the previous year and less closely with several other factors. When a curve is fitted to the data for three of the principal factors, for which data are available, by the methods of least squares the curve is almost identical with the actual consumption curve, as shown by Fig. 2.

Many of the known interrelationships between the usage of fertilizers and other factors are discussed by Parker and his coworkers (*22*).

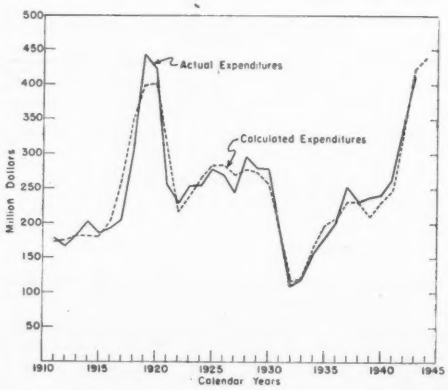

Fig. 2. Actual versus calculated expenditures for fertilizer

Foreign Fertilizer Statistics

The extent to which fertilizers are produced and consumed in other countries affects the fertilizer industry of this country and also the export and import markets for agricultural products. The usage in other countries may also point out chances for improved practices in this country.

For many years prior to the last War the Bureau of Foreign and Domestic Commerce collected and published statistics on fertilizers for all countries whenever obtainable.

Recently Jacob (*9*) made a special study of the fertilizer situation in wartime Germany

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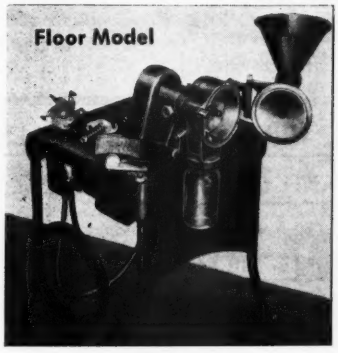

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for the U. S. Army of Occupation. Several members of the division have also served the Combined Food Board, the International Emergency Food Council, and other organizations as consultants. This work is largely statistical in nature.

While this division is in no position to collect statistics regularly from other countries it can profitably use them. Clark and Sherman (*3*) made a study of such statistics for the years immediately preceding the beginning of the last War. It is believed that this division should file reports on fertilizers from other countries and from the Departments of State and of Commerce and watch them for developments of interest to American agriculture. Such information should also enable the division to continue to be of service to our armies of occupation, to the United Nations Food and Agricultural Organization and to the International Emergency Food Council.

Conclusions

The proper function with regard to fertilizer statistics of the Division of Soils, Fertilizers, and Irrigation of the U. S. Department of Agriculture seems to include the following duties:

1. Collect the fertilizer statistics published by State Fertilizer Control officials, other Federal Government Agencies, the fertilizer industry, foreign governments, and other sources.

2. Analyze the available data and supplement it when necessary to complete the picture. Study the results at appropriate time intervals with a view to determining the fundamental facts regarding fertilizer resources, supplies, composition, manufacturing practices, farm practices, prices, consumption and the relationships between these factors and soils and crops. Determine also changes, trends and uneconomic or unwise practices.

3. Publish the results with appropriate interpretations for the benefit of agriculture.

4. Act as a central clearing house for statistics of all kinds relating to fertilizers for the benefit of all interested parties.

It should be emphasized that accurate and uniform State consumption reports on the tonnage of each kind of fertilizer are essential for the statistical work of the Department of Agriculture. When these figures are published by counties on a basis comparable with other States, they are of greatest usefulness to the Federal Government and agriculture as a whole.

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The U. S. Bureau of Mines reports an output of sulphur during August of 391,396 tons, which is a record for any month. Shipments are being made in about the same amount as production and stocks on hand at producers' works continue at about 3,400,000 tons. During 1947 the monthly average production has been 351,802 tons, as compared with 310,637 tons during 1946.

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of THE AMERICAN FERTILIZER, published bi-weekly at Philadelphia, Pa., for October 1, 1947.

STATE OF PENNSYLVANIA } ss.
COUNTY OF PHILADELPHIA }

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared A. A. Ware, who, having been duly sworn according to law, deposes and says that he is the editor of THE AMERICAN FERTILIZER, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

Name of	Post-office Address
Publisher, Ware Bros. Company,	1900 Chestnut St., Phila., Pa.
Editor, A. A. Ware,	1900 Chestnut St., Phila., Pa.
Managing Editor, None.	
Business Manager, A. A. Ware,	1900 Chestnut St., Phila., Pa;

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

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5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily, tri-weekly, semi-weekly and weekly publications only.)

A. A. Ware, Editor.

Sworn to and subscribed before me this 17th day of Sept., 1947.

A. F. Walsh,
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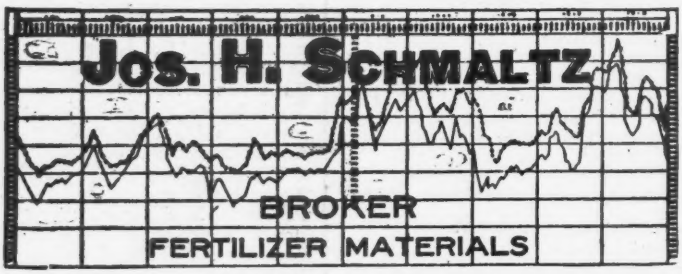

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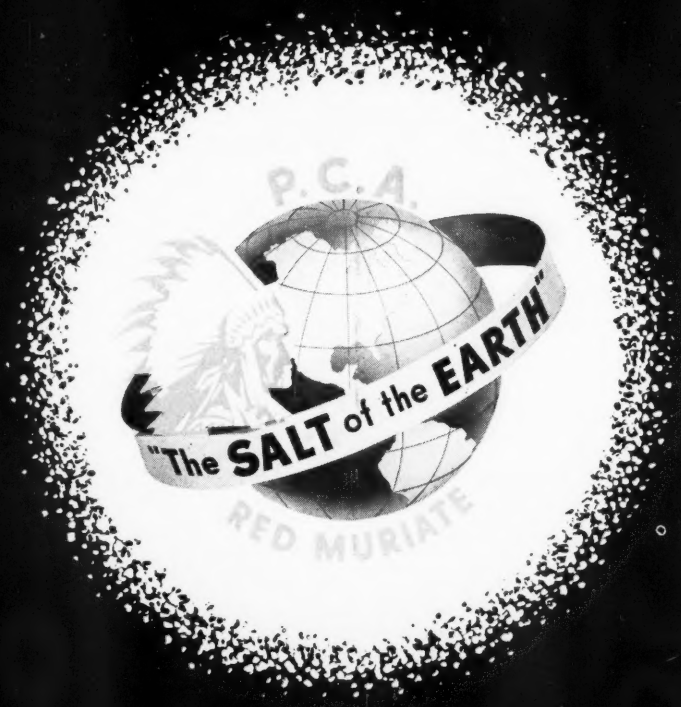

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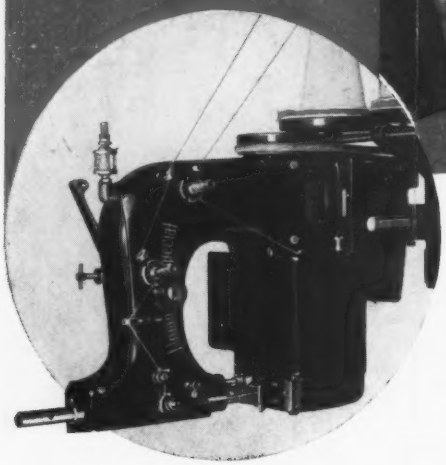

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